

ABSTRACT

VORTEX COOLING FOR TURBINE BLADES

5 A near wall cooling technique for cooling the pressure and suction
sides of a turbine airfoil that includes a matrix of cells oriented chord-wise and
extending longitudinally having vortex chambers with vortex creating
passages feeding coolant from interior of the blade to each of the cells,
interconnecting passageways interconnecting each of the vortex chambers and
10 a discharge film cooling passageway discharging coolant adjacent the outer
surface of the pressure and suction sides. The alternate passageways are
staggered and each are tangentially oriented to introduce a swirling motion in
the coolant as it enters each of the vortex chambers. The cells may be oriented
to be in a staggered or in an in-line array and the number of cells, the number
15 of vortex chambers and the dimension of the cells, vortex chambers and
passageways are selected to match the heat load and the temperature
requirements of the material of the blade. The direction of flow within each
cell is selected by the designer. The aft portion may be internally cooled before
discharging the coolant as a film upstream of the gage point to avoid
20 aerodynamic losses associated with film mixing.

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